Coooolll: A Deep Learning System for Twitter Sentiment Classification

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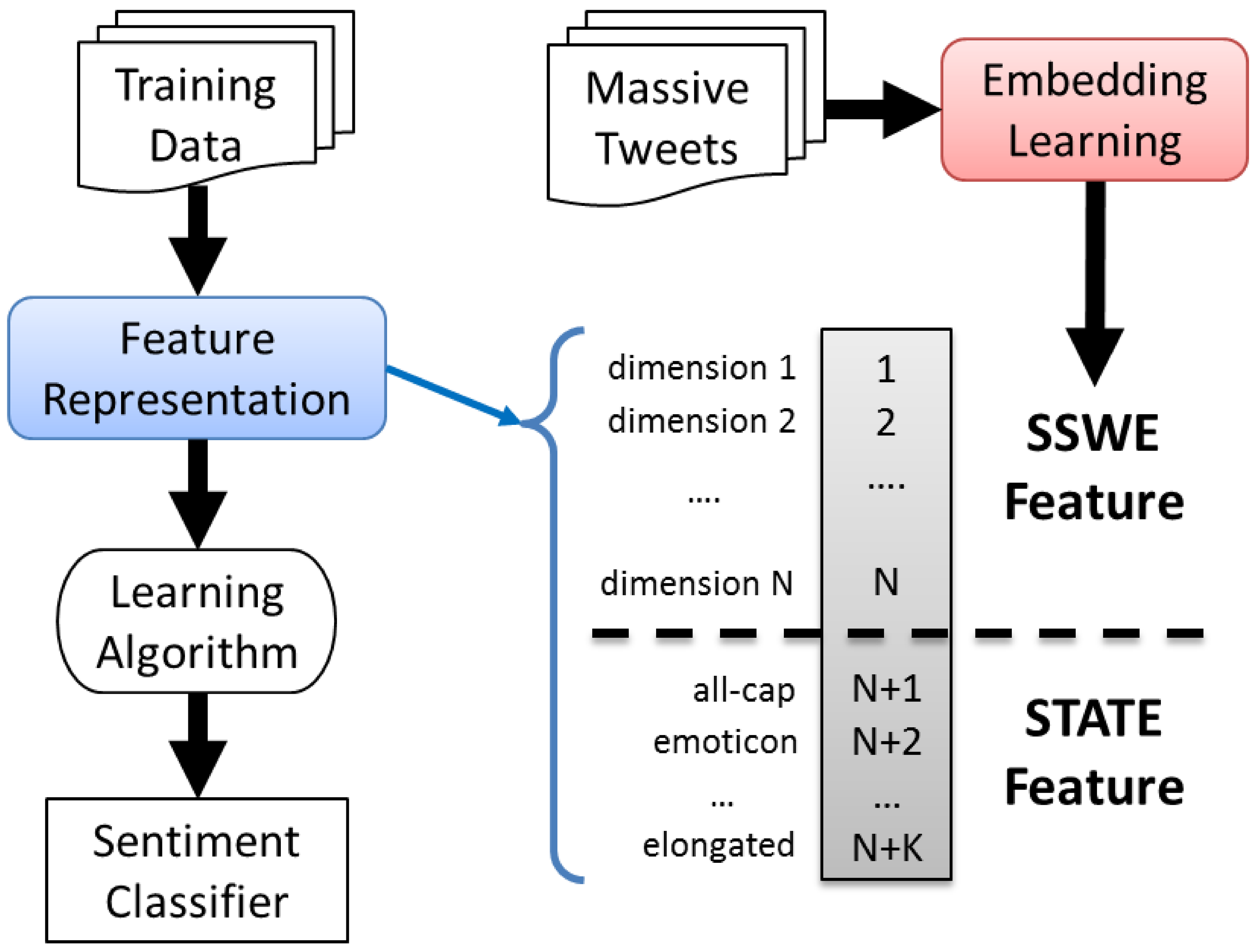
1. Introduction

- Twitter sentiment classification aims to classify the sentiment of a tweet as positive/negative/neutral.
- Feature representation is crucial for Twitter sentiment classification
- In this work, we learn features automatically through sentiment-specific word embedding (SSWE).

2. Our Approach

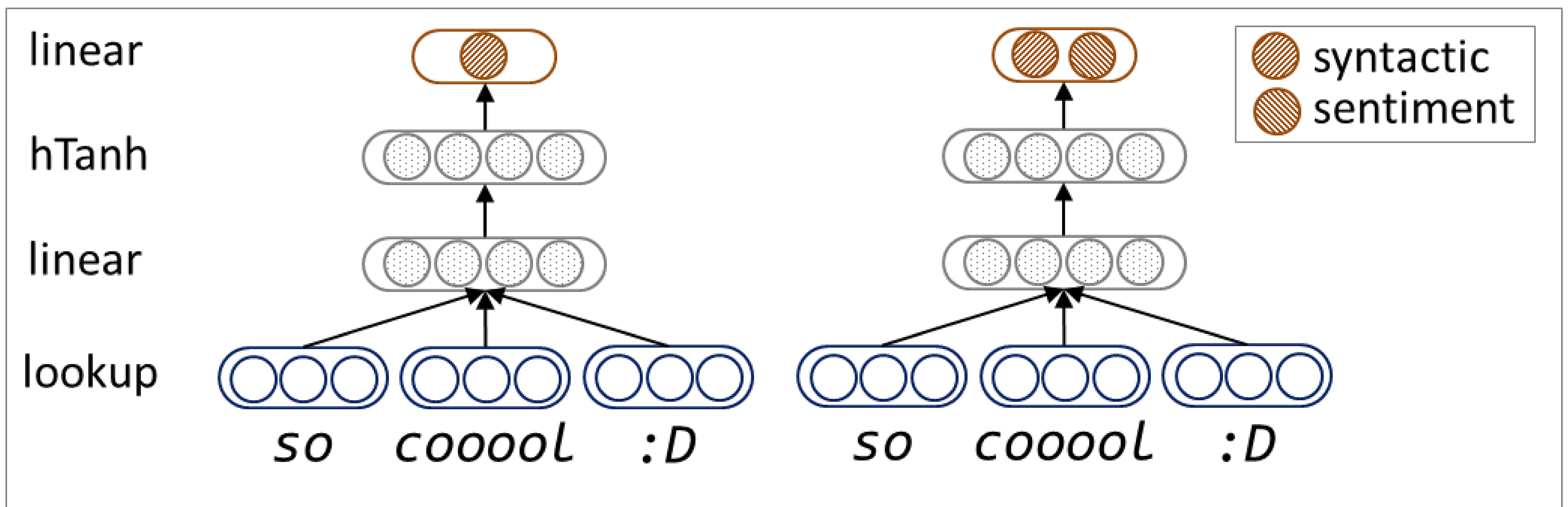
- We learn sentiment-specific word embedding from massive tweets collected by positive/negative emoticons
- We apply SSWE as features for building the sentiment classification in a supervised learning framework.



3. The Official Rank

Test Dataset	Rank (From 50)
Tweet 2013	3
SMS 2013	2
Tweet 2014	**2**
Sarcasm 2014	24
Live Journal	5
Macro	12
Micro	2

4. Sentiment-Specific Word Embedding



(a) **C&W** (b) **SSWE$_u$**

- **C&W**
  - Use the contexts of words
  - Hinge loss

$$\max(0, 1 - f^{cw}(t) + f^{cw}(t^r))$$

- **SSWE$_u$**
  - Use the contexts of words and the sentiment of sentences
  - Hybrid hinge loss

$$\alpha \cdot \max(0, 1 - f^{cw}(t) + f^{cw}(t^r)) +$$
$$(1-\alpha) \cdot \max(0, 1 - \delta_s(t) \cdot f_1^{u}(t) + \delta_s(t) \cdot f_1^{u}(t^r))$$

5. Experiments

- Apply SSWE on positive/negative/neutral and positive/negative classification of tweets

Method	Positive/Negative/Neutral					Positive/Negative				
	T1	T2	**T3**	**T4**	T5	T1	T2	**T3**	**T4**	T5
SSWE	70.49	64.29	68.69	66.86	50.00	84.51	85.19	85.06	86.14	62.02
Coooolll	72.90	67.68	**70.40**	**70.14**	46.66	86.46	85.32	**86.01**	**87.61**	56.55
STATE	71.48	65.43	66.18	67.07	44.89	83.96	82.82	84.39	86.16	58.27
W2V	55.19	52.98	52.33	50.58	49.63	68.87	71.89	74.50	71.52	61.60
Top	74.84	70.28	72.12	70.96	58.16	- -	- -	- -	- -	- -
Average	63.52	55.63	59.78	60.41	45.44	- -	- -	- -	- -	- -

- Compare with other word embeddings on Twitter sentiment classification (results on SemEval2013)